



INTERNATIONAL FOOD  
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IFPRI Discussion Paper 00738

December 2007

## **Seed Provision and Dryland Crops in the Semiarid Regions of Eastern Kenya**

Latha Nagarajan, International Food Policy Research Institute  
Patrick Audi, International Crops Research Institute for Semiarid Tropics  
Richard Jones, International Crops Research Institute for Semiarid Tropics  
and  
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Environment and Production Technology Division

## **INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE**

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## **ABSTRACT**

Over the last two decades, several seed-related programs have been initiated in eastern Kenya to improve farmers' access to quality seeds of dryland cereals and legumes. They are provided during two occasions, regular and emergency times. But very often, the formal supply mechanisms limit their role in provision of seeds other than maize. In the absence of any formalized systems of seed provision for other dryland crops, such as sorghum and pigeon pea, farmers have preferred local markets for their seed needs, especially during distress periods. Here we have examined the role of various seed-intervention programs in eastern Kenya, along with the strengths and weaknesses of each program. We have also underscored the importance of local markets and their actors in meeting the needs for non-maize and bean seeds in these marginal environments. For this purpose, detailed, informal interviews were conducted during October–December 2005 with all the stakeholders, namely public and private institutions and vendors in eight major local markets in eastern Kenya. The results of the study call for synergies between existing formal (private, public, and other development initiative) systems and informal (local market) seed systems to enhance crop yields and the diversity of dryland cereals and legumes through effective seed-supply interventions.

**Key words:** seed interventions, local markets, seed systems, dry lands, seed access



## 1. INTRODUCTION

Farmers in the semiarid lands of eastern Kenya have traditionally relied on food staples such as sorghum, and in drier parts, pearl millet, generally grown in mixed stands with a range of legumes, including beans, cowpea, green gram, and pigeon pea. These crops are both used for consumption and sold for cash in local markets. The farming systems are relatively complex because of the high rainfall variability typical of the semiarid tropics. Over the last two decades, the maize economy of the high agricultural potential areas has had a significant impact in the semiarid districts of eastern Kenya, as farmers have largely switched from growing sorghum in favor of maize for a number of reasons. For instance, in years of good production, there is always a ready market for maize because of government interventions in marketing; whenever there is crop failure, food relief tends to be delivered in the form of maize, and maize production is encouraged through the repeated supply of free maize seed following the frequent droughts that affect the area. These policies are now being questioned both by policymakers and relief and development organizations in light of repeated crop failures, and there is renewed interest in promoting drought-tolerant crops, such as sorghum and pigeon pea, which are known to be well adapted to the harsh environment (Government of Kenya, 2005). However, for this to happen, farmers have to be able to reliably access seeds of these crops through well-built seed supply mechanisms that provide necessary diversity as well as good quality planting materials.

In eastern Kenya, farmers generally obtain seeds during two major occasions, *regular* and *emergency* times. They access seeds from various sources, such as private seed firms (mostly for maize), seed-intervention projects, relief agencies, village-level local markets, and farmer or informal exchanges. In the case of dryland crops, though public investments have been made in the development, testing, and release of improved varieties, they have not benefited farmers, as the formal and commercial seed sector prefers to focus on maize seed production and marketing, where there is a regular demand for seed. In the absence of any well-developed formal seed systems<sup>1</sup> for the dryland crops, the local markets play a key role in meeting the seed needs of the farmers in these marginal environments (David and Sperling 1999; Tripp 2000; Jones et al. 2001; Rohrbach et al. 2002; Sperling and Longley 2002; Sperling et al. 2006). The vendors in the local markets are an important source of information about improved crops and varieties and associated agronomic practices, although their capacity is still limited. For instance, pilot initiatives to test-market small seed packs of dryland crops through local markets and their vendors in Kenya and other countries of the region have shown that farmers are interested and willing to pay for small amounts of improved seed to access new varieties (David and Sperling 1999; Rohrbach and

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<sup>1</sup> A seed system is "an interrelated set of components including breeding, management, replacement, and distribution of seed" (Thiele 1999).

Malusalila 2000). Thus, it could be seen that the existing local market systems in these marginal environments could be strengthened to meet the seed needs of the farmers sufficiently.

This study adds to the literature on various seed-provision mechanisms in Kenya and elsewhere in Sub-Saharan Africa. Though all these studies have recognized the importance of local markets, not many studies have focused on their role in seed provision during normal and distress periods. Therefore, we have underscored the need to examine the role of local markets in seed provision of dryland crops in the semiarid regions of eastern Kenya. In this paper, we have used the term *local markets* to mean local seed/grain markets operated at the village or community level, distinct from formalized, commercial structures. These markets are locally organized, and the participants are mostly farmer-producers, and sometimes traders with products from distant sources. In these local markets, while some farmers-traders treat seed specially, there is not always necessarily a distinction between seed and grain. These local markets are not monitored or controlled by government policies and regulations. Rather, they are guided by local technical knowledge and standards and by local social structures and norms. The term *dryland crops* has been used here to mean two major crops, namely sorghum, a food staple, and pigeon pea, a cash crop, grown in the marginal environments of eastern Kenya. However, findings from this study could be generalized for all the other dryland crops grown in the region. In addition, we also have attempted to study current as well as past seed-intervention programs that have been implemented in eastern Kenya, and we have considered policy implications for improving access to seed of dryland crops during regular and emergency times.<sup>2</sup>

The research design adopted for the study is described in Section 2. Existing and past seed-intervention programs that have been implemented by various stakeholders for dryland crops in eastern Kenya are described in Section 3. In the subsequent sections, each seed-provision mechanism is discussed in detail with its strengths and weaknesses. Policy implications with regard to the existing seed-supply mechanisms for dryland crops in eastern Kenya are discussed in the concluding section.

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<sup>2</sup> The conduct of the study also coincided with a failure of short rains (October–December 2005), which resulted in serious food and seed shortages in eastern Kenya. Subsequently, emergency/relief food and seed aid (eight input/seed fairs) was organized by the government of Kenya to ease the situation.

## 2. METHOD

Eastern Kenya was the primary focus of the study. The region comprises 13 districts, broadly classified under arid and semiarid land types belonging to an agro-ecological zone classification of three to seven (arid and semiarid regions). The average poverty levels in eastern districts are more than 60 percent (Central Bureau of Statistics 2005). The region is characterized by a bimodal rainfall pattern, with long rains in April–May and short rains during October–November. The eastern Kenya region mostly benefits from short rains (<400 mm), which are poorly distributed but more reliable than long rains.<sup>3</sup> In eastern Kenya, sorghum and pigeon pea are the major dryland crops, apart from maize and beans, in terms of area and production (FAOSTAT 2005). For this research study, five major districts (Kitui, Makueni, Mwingi, Mberre, and Embu) in eastern Kenya were selected to represent the presence of (1) local markets where seeds and grain of locally adapted crops such as pigeon pea and sorghum are traded on a regular basis, (2) the use of both traditional and modern varieties of these crops among the local farming community, and (3) the existence of seed-based intervention programs operated during regular and emergency times for major dryland cereals and legumes. The study was conducted between October and December 2005 during the short-rains season—the major planting season for the selected region.

Our survey included visits to eight major local markets in the selected districts. We found four types of vendors selling seeds to farmers in these markets. They are agro-vets (private company dealers of agricultural inputs), grain traders and local shop owners (also known as full-time resident retailers), farmer-traders, and mobile or market hoppers. These vendors primarily sold seeds before the planting season or immediately after short rains. We held several informal as well as group-level discussions with different vendors involved in seed provision at the local markets. We also conducted informal discussions with farmers who participated in the markets to learn about their seed-procurement behavior during normal and emergency times. In addition, to understand the role of various institutions involved in seed provision, we held several discussions with scientists and representatives from national and international agricultural research institutions (Kenya Agricultural Research Institute [KARI] and International Crops Research Institute for Semiarid Tropics [ICRISAT]); private seed firms (Kenya Seed Company [KSC], East Africa Seed Company, and Western Seed Company); the Ministry of Agriculture (MoA); and nongovernmental agencies (Catholic Relief Services [CRS] and its partners). The information on public sector involvement was compiled from secondary-level sources and cross-checked with officials from the sector. Further information on seed-policy-related issues (seed laws and legislation) was gathered through interviews with officials from Kenya Plant Health Inspectorate Service, Seed Traders Association of Kenya, and the African Seed Traders Association.

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<sup>3</sup> Farmers usually begin their sowing operations for major staple crops (maize, beans, sorghum, pigeon pea, and other legumes) during the short-rains season.

### 3. SEED PROVISION IN EASTERN KENYA

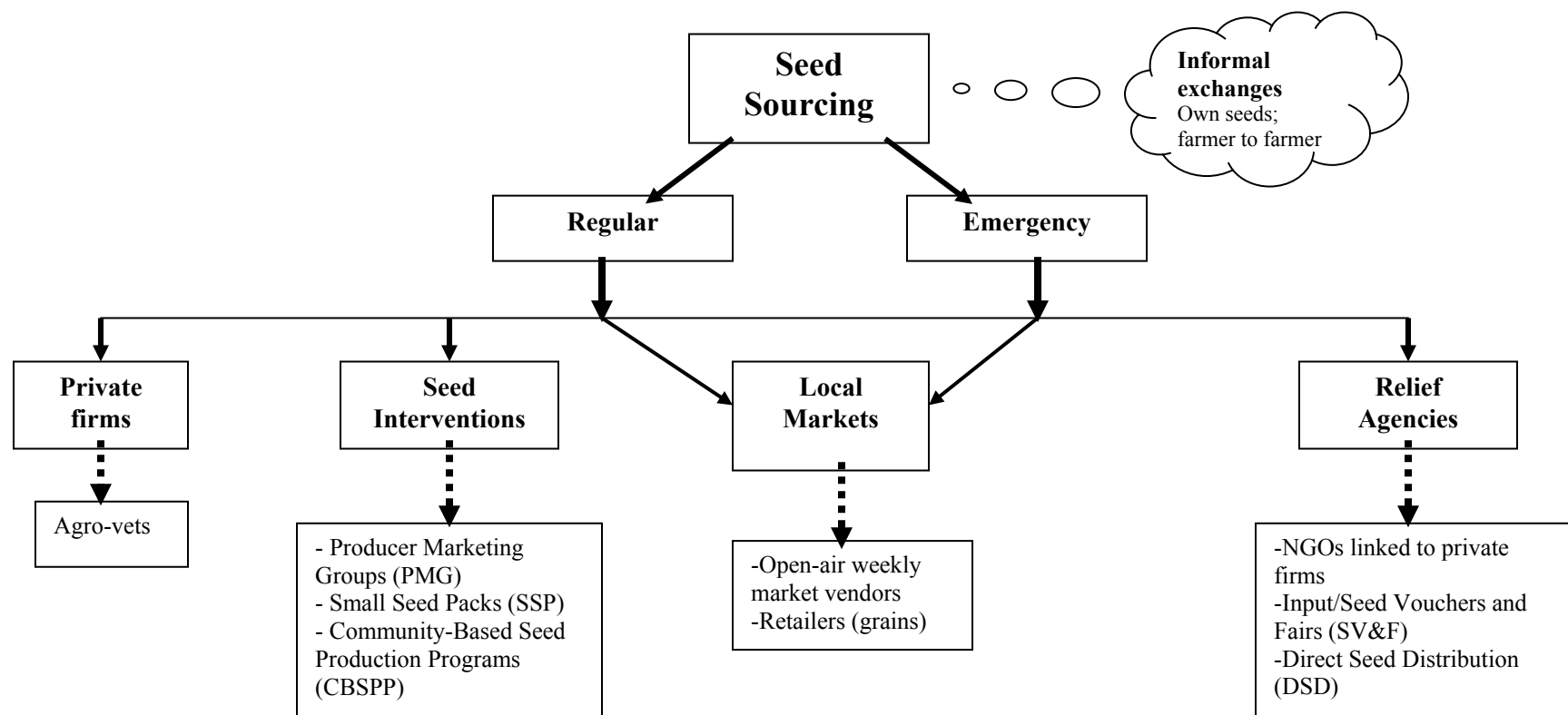
Farmers search for seeds for various reasons, including emergencies caused by disasters, poverty, a desire for better seed quality, and a desire to use new varieties. Each type of seed demand requires different kinds of responses (Tripp 2000). It is helpful to differentiate between regular and emergency situations and the types of farmer demand for seed associated with each of these situations. During regular periods, farmers demand replacement seed for varieties they already grow when the quality of the seed deteriorates over cropping seasons due to cross-pollination in the fields, inadvertent mixture of seed during harvest or storage, or seed-borne diseases. They may also demand seed in order to change varieties (including to adopt modern varieties), to increase the yields they expect, or to maintain yields in the face of losses due to the evolution of air- or soil-borne pests and diseases. A third type of demand is *input emergency*. Input emergency refers to the seed needs of farmers who normally save seed but were unable to do so because of a poor harvest, civil conflict, or some other disaster. In this case, demand for seed is a search for a perishable physical input that the farmer has been unable to maintain. This third category includes what Tripp (2000) calls emergency and poverty demand. Sperling (2002) refers to this as acute stress (caused by a sudden natural disaster, conflict, or unforeseen event) and chronic stress (a continuous cycle of poverty).

Nevertheless, the resource-poor farmers, especially in the marginal environments, normally depend on local (grain) markets for their seed requirements (Cromwell et al. 1993; Nagarajan and Smale 2005). The local markets are active and resilient even after disasters, as evidenced by markets in Rwanda during 1994–1995. There are several positive instances of the dissemination of modern varieties of seeds through farmers and local markets (Sperling et al. 1993; Witcombe et al. 1999; Jones et al. 2001). Nearly 25–50 percent of the farmers in Rwanda, Kenya, and Somalia sought local markets for their seed and diversity needs once their own saved stocks went down (Sperling 1997; Sperling 2002; Longley et al. 2001). Sperling (1998) also observed that the local markets in Rwanda had sufficient supplies of preferred bean and sorghum varieties (mostly grains but suitable for seed), but the major problem was that many farmers did not have adequate resources to purchase them from the markets. Though local markets meet the existing demand, the quality of the materials supplied is often questionable and compromised, as the distinction between grain and seed is very thin in many cases. Also, in places where NGO-led, free seed-delivery programs were in operation, the traders in the local markets could not compete with them. Most of the NGO-led relief programs were not sustainable, and after their withdrawal, farmers found it hard to obtain seed or fertilizer because the local market for the seeds no longer existed in the affected farming communities (Rohrbach and Rusike 2005). Free seed distribution also encouraged a “dependency syndrome” among farmers and led farmers to discontinue the tradition of saving seeds. This also raises an

important question regarding the existence of local markets in the presence of seed-development programs.

In eastern Kenya, several seed-related initiatives have been implemented to provide quality seeds to farming communities during regular and emergency situations. Figure 1 summarizes various sources through which farmers accessed seeds of dryland crops during both those situations. The seed interventions in regular times were mostly community based and focused on training local farmers to produce and market good quality planting materials within the communities. In the late 1990s, three major community-based seed projects were implemented, focusing on providing seeds of dryland cereals and legumes in eastern Kenya. They were community-based seed-production programs, promoted by the KARI-Winrock initiative, producer marketing groups initiated by ICRISAT, and the small seed packs programs of ICRISAT. These seed-intervention programs were also active during and after disaster periods in the communities. During disaster periods, the public institutions, in partnership with NGOs, implemented certain need-based seed programs in eastern Kenya. For example, direct seed distribution, and in recent years, seed (and input) vouchers and fairs, introduced by CRS, are the two popular seed-relief approaches followed in Kenya and elsewhere in Sub-Saharan Africa. Private seed firms also provided negligible amounts of seed, especially for crops like maize and sorghum, either through various government programs or through their own networks, during normal and emergency times. Despite all the seed-based initiatives, the majority of farmers get their seeds either from their own reserves, from their neighbors, or mostly from village-level seed/grain markets, especially those seeds of dryland crops. Especially after prolonged and recurrent droughts, the weekly village-level markets in eastern Kenya met most of the seed requirements of the farmers. A detailed description of each of these seed interventions operated during regular and emergency periods and the role of local markets in seed provision is described in the following sections.

**Figure 1. Sources of seeds for dryland crops in eastern Kenya**



Source: Conceptualized by the authors.

## 4. SEED PROVISION DURING REGULAR TIMES

### Private Firms

Liberalization of agricultural input markets in the late 1990s has seen the entry of several international seed companies into the Kenyan market and the emergence of more local seed companies. According to Seed Traders Association of Kenya, 40 registered private firms are producing and distributing various crop seeds, including grain, legume, vegetable, and flower seeds. In Kenya, formal seed purchases (public and private) account for nearly 52 percent of the total value of seeds used (Ayieko and Tshirley 2006).<sup>4</sup>

The formal seed purchases are dominated mostly by maize and other industrial crops. Nearly 90 percent of the commercial seed sector in Kenya is involved in the multiplication and distribution of hybrid maize seeds in the high-potential areas. Only 4 of the 40 registered firms are involved in the seed production of dryland crops, mostly open-pollinated varieties. They are KSC, East African Seed Company, Western Seed Company, and Dry Land Seed Company of Machakos. These private firms are involved in the supply of improved varieties of dryland crops, mainly sorghum. In the case of sorghum, currently *Serena* and *Seredo*, improved pure-line selections introduced during the 1970s, dominate the market. In the case of pigeon pea, due to various development interventions (for example, Producer Marketing Groups [PMGs], Small Seed Packs [SSP] and Community-Based Seed Production Programs [CBSPP]), farmers are aware of certain improved cultivars. Yet the choice (improved cultivars) offered by the formal seed sector for dryland cereals and legumes is negligible compared with that for maize, beans, and vegetable crops. The private firms are not keen on producing high-volume, low-value seeds, including open-pollinated varieties (OPVs) of dryland cereals (sorghum and millet) and legumes (pigeon pea, cow pea, and green gram). They consider these “secondary” crops of importance (add-ons) in terms of their sales and research importance. For example, for KSC, hybrid maize constitutes nearly 90 percent of its business, followed by OPV maize (5 percent) and vegetables (5 percent). Companies like Western Seed, which specialize in the production of maize hybrids, also produce open-pollinated varieties of maize, sorghum, millet, and other grain legumes, but those constitute only 20 percent of the company’s total portfolio. Mostly the open-pollinated seed varieties (especially sorghum and millet) are produced by private firms to meet the demand from relief agencies or for export to neighboring countries like Sudan, Tanzania, and Uganda. However, the demand for such contracts is not regular, and the quality of materials (in terms of purity and varietal integrity) is also highly questionable.

On the demand side, one could say that the prices farmer are willing to pay for improved varieties or high-quality seeds is also lower than the price at which these seeds are offered for two reasons: (1) a

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<sup>4</sup>Seed purchases through local markets constituted 8 percent; still 40 percent of the seeds used by the farmers are either farmer-retained or saved seeds.

good low-cost alternative always exists, that is, farm-saved seeds and (2) the price is high due to strict seed-certification regulations. The Kenyan seed law requires compulsory certification procedures for crops under schedule II, which includes dryland cereals (sorghum and millet) and legumes (pigeon pea, cowpea, and green gram). This allows Kenyan Plant Health and Inspection Services to impose stringent rules on all varietal releases, reproduction, and distribution of seeds of the crops under Schedule II. Further, the current seed law is not flexible about either truthful labeling (TFL) or Food and Agriculture Organization's (FAO's) quality declared seeds (QDS) procedures. This also limits the entry of small- and medium-scale seed enterprises in seed provision as well as in crop improvement research for dryland cereals and legumes. Therefore, in the absence of a comprehensive seed policy favoring dryland cereals and legumes, many farmers either buy illegal or fake certified seeds; one could come across many varieties in farmers' fields, (e.g., NPP670 pigeon pea)<sup>5</sup> that have not been released officially by the MoA in Kenya. In short, in eastern Kenya, which is frequently affected by droughts, demand for the improved cultivars of dryland crops (except maize and beans) is low and irregular, due to poor seed-replacement rates. Also, the existing seed laws in Kenya—such as the compulsory seed-certification procedure, which includes major dryland crops—have limited the participation of private firms. Though private firms' share of the seed market for crops like sorghum and pigeon pea is insignificant, the private firms still remain the prime source of certified seeds for the government programs—commercial -based direct seed distribution (DSD)—during normal and distress times, especially for crops like maize and beans.

## **Seed Interventions**

### *Community-Based Seed Production Programs*

Many development projects implemented in the arid and semiarid regions of Kenya have used community-level seed production as the major entry point for commercial seed development. For instance, the government of Kenya in collaboration with Danish International Development Agency (DANIDA) launched community-based seed bulking programs in the arid and semiarid regions during 1997–1998 to address farmers' needs for quality seeds. Improved varieties of grain legumes and cereals, officially released by the MoA were distributed to farmers for further reproduction for their own use and sales. Though successful in the provision of quality seeds of certain legumes (mostly cowpea and beans) and improved varieties of maize, the program did not enhance the availability of improved cultivars of other dryland cereals and legumes like sorghum, millet, pigeon pea, and green gram. The program also

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<sup>5</sup> In the Mwea division of eastern Kenya, a new pigeon pea variety, viz., Nairobi Pigeonpea 670 (NPP 670) was introduced through farm demonstration trials by the University of Nairobi in the early 1990s. A single on-farm demonstration trial resulted in the large-scale adoption (a nearly 70 percent adoption rate) of the variety in the region.



failed due to higher transaction costs, expensive procedures involved in contracts, and inadequate quality control measures adopted in sourcing seeds.

In the late 1990s, KARI-Katamani and Winrock initiated a CBSPP to enhance farmers' access to high-quality, improved cultivars of dryland crops by providing appropriate crop management information and buyback arrangements. Thus, the CBSPP was not introduced as a seed-emergency tool, but as a mechanism to provide long-term, sustainable solutions to local seed-market failures by improving access to improved varieties that are locally adaptable during normal and emergency times. The program initially encouraged the village-level farmers' groups to produce high-quality seeds, either for their use or for exchange with other farmers in the community. Table 1 describes the key features of the CBSPP operated in two major districts in eastern Kenya. Our group discussions with the beneficiaries of the CBSPP further indicated increased awareness of improved varieties of dryland crops among the farming communities. Also, the CBSPP facilitated immediate access to improved planting materials within the local communities, especially after disaster periods.

**Table 1. Details of the community-based seed production programs (CBSPP) in Makueni and Kitui districts, eastern Kenya**

<b>A. Makueni</b>	<ol style="list-style-type: none"> <li>1. The program was implemented by the DANIDA-funded Makueni Agricultural Project in 1998.</li> <li>2. Five metric tons of foundation seeds of improved pigeon pea, beans, green gram, cowpea, and maize were bought from the KARI seed unit between 1998 and 2004 for further reproduction.</li> <li>3. The seed was distributed to farmers through the Focal Development Area (FDA) Committee, at the sublocation level in five divisions.</li> <li>4. Farmers selected by FDA paid 25 percent of the seed cost at the market price.</li> <li>5. From 1998 through 2004, 100 metric tons of pigeon pea, bean, green gram, cow pea and maize seeds were reproduced and sold by farmers.</li> </ol>
<b>B. Kitui</b>	<ol style="list-style-type: none"> <li>1. Implemented by DANIDA-funded Kitui Agricultural Project in 2002.</li> <li>2. Three metric tons of foundation seeds of improved pigeon pea, beans, cowpea, green gram, and sorghum were bought from the KARI seed unit for further reproduction from 2002 through 2005.</li> <li>3. The seed production and distribution structure was similar to the CBSPP-operated one in Makueni district.</li> </ol>

Source: Author's survey

However, the program benefited only a few communities (25 percent) in all of eastern Kenya. The farmers' groups also incurred higher production and distribution costs compared with traditional seed sources (farm-saved seeds and local markets), though the seed quality was good. The CBSPP activities were mostly dependent on small farmers who produced seeds under rain-fed conditions, and this affected the continuous supply of seeds during prolonged dry periods to other members in the community. Furthermore, the seed prices offered through CBSPP groups and their networks were not as attractive as

those in local markets. The diversity of crops and varieties available through the CBSPP were also very limited. Also, the program participants did not carry out periodic restoration of foundation seeds and varieties, which affected the quality and purity of seeds produced by the groups. However, the major failure of CBSPP could be attributed to poor buyback arrangements and inefficiency in creating local demand for improved varieties of dryland crops. The stakeholder participation was also limited in many cases. For instance, the local traders did not participate in any of these community-based programs. The farmers' groups participating in seed-production programs were neither legally recognized nor licensed as authorized seed traders or merchants. The agencies involved in buyback arrangements (e.g., MoA) also could not buy all the seeds produced by the groups, as there was no continuous or sufficient demand from the local markets and communities for the fresh seeds. Some of the varieties produced by the groups were not adapted to local environments. The existing emergency or relief seed mechanisms also undermined the CBSPP beneficiary areas by supplying free seeds, or handouts, during times of drought. Other weaknesses of CBSPP included (a) weak supply linkages between traders and farmers' groups with no or not proper contracts for regular and continuous supply of seeds, that is, sustainability of the program was not envisioned, and (b) lack of adequate information on crop varieties sold by the groups, with very poor quality standards adopted. Hence, the results from these initiatives were disappointing, with little commercial sustainability. However, such programs could be effectively used to produce and provide seeds during off-seasons and at times of emergency, especially by organizing seed-production activities in areas with minimal irrigation facilities.

### *Producer Marketing Groups (PMGs)*

Since 1999, ICRISAT researchers have been involved in developing high-yield pigeon pea varieties suitable for semiarid lands of Kenya. With encouraging results on the production and yield front, conducted at the farmers' fields, ICRISAT in early 2000 set up PMGs in eastern Kenya. The major objective of this initiative was to promote the availability of improved cultivars of pigeon pea and chick pea and to enhance the production and marketing through farmers' groups and their collective action efforts. The program was implemented in two major pigeon pea growing districts, Makueni and Mberre. Farmers' groups (30 farmers per group) were mobilized at the community level and given training in quality seed production, crop management, and marketing techniques. To start with, the groups were given small samples of improved cultivars of pigeon pea and cow pea as a starter seed kit to multiply and trade among the community members. The mobilized groups in turn set up small shops at the villages to sell quality seeds; the shops served as an assembling center for the grains also. A recent study conducted by Shiferaw et al. (2006) to measure the impact of the collective action efforts of PMGs noted that the farmers in and around the PMG areas have benefited from their access to improved cultivars of pigeon

pea and chickpea. Further, the members of the groups also had received nominal prices (slightly higher than in the local weekly markets) for their produce and seeds. The PMGs also had been well recognized by the local communities they served. During the first year (2000–2001) of formation of PMGs in eastern Kenya, nearly 50 tons of pigeon pea grain valued at 800,000 Kenya shillings (US\$11,000) was marketed by 200 farmers in Makueni; and more than 30 tons of chickpea grain valued at 900,000 Kenya shillings (US\$12,000) was marketed by farmers in Mberre district. Our interviews further confirmed that the PMG shops in these districts serve as important knowledge centers in the communities for the dissemination of new varieties of pigeon pea and cow pea. The highlights of the PMGs operated in the Makueni district (based on the author's 2005 survey) are as follows:

1. The program was implemented by ICRISAT in 2001–2002. Ten tons of improved pigeon pea seed were produced and provided to farmers' groups in four divisions between 2002 and 2006.
2. Three kinds of pigeon pea seeds (short-, medium-, and long-duration types) were provided to members for further reproduction.
3. The group members were trained to produce good quality seeds of improved pigeon pea varieties and were trained in grain marketing.
4. The grain and seed shops owned by the PMGs sold seeds on a cash and credit basis. The groups were also linked to major pigeon pea grain buyers in urban centers.
5. Each group in turn selected farmers within the community to produce and distribute (sell) to the other members in subsequent seasons.

We also had detailed discussions with farmer participants/beneficiaries of PMGs in Makueni district, comparing various seed-based interventions and their impacts on crop varietal diversity of dryland crops. They revealed that PMGs were much more effective in providing more cultivars and also improved access to quality seeds compared with community-based initiatives and seed fairs. Also, the farmers located in PMG sites had relied more on their own on-farm sources in the villages compared with other intervention areas, especially after or during a bad season. The price of seeds was also relatively lower and more stable in PMG areas due to proper marketing linkages for seeds and grains.

However, the PMGs lack the concept of financial sustainability and competitiveness, especially during emergency situations like drought. It was further shown that though there was a greater variety and higher quality of produce sold through PMGs than local markets, usually no premium price was associated with the PMG sales. Many times the PMGs are constrained by low volumes, price variability, and poor business skills (Shiferaw, 2006). Organizing the PMGs at the regional level into a union or federation with more autonomy and financial links between groups would help address the problems caused by low volumes and high price variability and would sustain financial operations in the long run.

### *Small Seed Packs (SSP) Distribution*

Farms in semiarid eastern Kenya are small and marginal, and the farmers cannot afford and do not need large quantities of quality seeds. They often complain that the commercial seed is expensive because the packages are too large (Tripp 2000). Rohrbach and Malusalila (2000), in their study analyzing the demand for seeds of nontraditional crops (OPVs of sorghum, millet, and groundnut) in Zimbabwe, found that among the types of seed packets sold, ranging between 500 grams and 15 kilograms, the 500-gram packages were the most popular among those with small, marginal farms. Mostly the improved varieties of seeds, especially grains and legumes, are supplied in 2- to 5-kilogram packets. Often small and marginal farmers were forced to buy them in bulk quantities, which turned out to be expensive, especially while buying for seed purposes. This was also one of the major constraints faced by the seed consumers, especially in the local markets.

The SSP program, a strategy of marketing seed in small packs through village retailers, has been used to address farmer demand for improved varieties in Zimbabwe, Kenya, and Malawi (Tripp 2000). Further, the production and sale of small packs (“mini-packs”) of new varieties of seed can provide additional business to emerging local seed enterprises, help develop a market for a wider range of seed types, and support the diffusion of new crop varieties. Such schemes often attract outside support from donors interested in promoting use of new seed or responding to emergency situations characterized by loss of seed stocks during disasters. Thus, packaging of seed in small quantities has emerged as an important means of reaching small-scale farmers in Sub-Saharan Africa (DeVries and Toenniessen 2001).

During the 1998–1999 crop season, ICRISAT devised an approach to sell seeds in small packs retailed through formal and informal seed outlets to deliver seeds of improved dryland crops in villages. Twenty-eight agro-vets or input shops spread over various market centers in semiarid eastern Kenya were selected to market about 3 tons of pigeon pea, sorghum, pearl millet, and beans seeds produced by a CBSPP. The average size of the seed packets ranged between 500 grams and 1 kilogram. More than 10 varieties of crops were handled through this method. Table 2 summarizes the quantity of seeds traded in eastern Kenya through the SSP program during the 1998–1999 seasons. Of all the crops and varieties sold through the outlets, it was found that the least favored crop or variety was the pearl millet, followed by the long-duration pigeon pea variety ICEAP 40 and dolichos. In eastern Kenya, demand for improved bean varieties was always higher and could be evident from its seed sales in the region. Also, beans are highly susceptible to both droughts and excess rainfall. So farmers are always less secure about planting bean seeds compared with any other dryland crop seeds in eastern Kenya (Omanga 1999) and hence often replace seed their seed stocks.

**Table 2. Quantity of seeds (in kilograms) sold through small seed packs (SSP) program in eastern Kenya (1998–1999) (N = 28)**

Crop	Variety	Total seeds stocked by the traders	Total seeds sold
Beans	Kat X56	600	600
Beans	Kat Bean1	660	660
Beans	Kat Bean 2	330	330
Cowpeas	Kat 80	180	150
Dolichos	DH1002	210	105
Millet	ICMV221	110	60
Pigeon pea	ICEAP 00040	190	105
Pigeon pea	ICP 6927	170	120
Pigeon pea	KarimMbazi-1	150	130
Pigeon pea	Kat 60/8	110	100
Pigeon pea	NPP 670	110	110
Sorghum	KMtama-1	330	270

Source: Omanga et al. (1999)

The SSP program also efficiently used the services of already-operating CBSPPs by providing an outlet for the seeds produced by the farmers' groups. More than 86 percent of the seeds produced through CBSPPs during that season were successfully sold through the SSP scheme and outlets. Initiatives such as SSPs showed their potential, especially in semiarid regions, by introducing new varieties and stimulating interest among the farming communities in affordable, commercial purchases of seeds for dryland crops. For the first time, the small seed traders or village-level stockists were also involved and offered improved seeds of many of the dryland cereals and legumes that had no commercial importance. The initial responses to the small packs program were encouraging, both from the farmers' and retailers' perspective. Eighty percent of the farmers were willing to pay twice the price of grain to get an improved, fresh stock of seeds every year; and 42 percent said they would buy fresh seed every year if it was available through small packs every year. Further distributing these small seed packs through rural input suppliers also helped to develop markets for quality seed.

However, Tripp (2000) noted that the major concerns regarding this program would be the cost of distribution and the recovery of the seed cost by the participating merchants. This might be an effective instrument, especially for research-based firms, to promote new varieties or varieties in the pipeline. The major constraint in extending this approach on a large scale is the seed-sector regulations for dryland crops (schedule II) in Kenya, which require certification. Another drawback is concern about the sustainability of the seed supply operations in the long run, particularly in revamping or rejuvenating the new seed materials from the implementing organizations. The SSP program is still implemented as a part of prevarietal release by research stations (KARI, ICRISAT). However, it is not clear if the existing seed regulations in Kenya would allow the SSP program to operate commercially on a large scale for a long time.

In recent years, ICRISAT has continued using this approach to improve access to seeds of dryland legumes in eastern Kenya through its Lucrative Legumes Project (LLP) and producer marketing groups (PMGs). Both these initiatives favor the distribution of SSPs to make quality seeds an affordable proposition for small and marginal farmers. The seed regulations<sup>6</sup> limited the participation of public and private firms in providing new varieties. Also, the very low demand for the seeds of dryland cereals and legumes has resulted in poor adoption of improved cultivars in eastern Kenya. PMGs and LLP initiatives have tried to work around the existing seed supply constraints by formalizing some of the informal channels—that is, reproducing, disseminating, and commercializing seed sales through farmers' groups rather than through the legal forms of formal institutions per se. Again, it's not clear if the current seed regulations will permit the continued reproduction and dissemination of new varieties.

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<sup>6</sup> Though it is possible to release new varieties by collaborating with Kenyan Agricultural Research System, it takes at least four years of field testing before any official release, and the seed regulations in Kenya do not allow any concessions in this regard.

## 5. EMERGENCY/RELIEF SEED PROVISION

Relief seed is relatively a new concept in Kenya, started in 1992 as an effort to provide seeds to communities faced with acute food and seed shortages following long, recurrent droughts. During the 1990s, most of the seed aid followed a centralized tender and distribution system to the affected areas, with little participation by the target groups. However, with the introduction of the Community Based Food Distribution System by the World Food Program in 2000, CRS started shifting its seed-distribution policy toward strengthening community-based systems and promoting the use of locally available seeds of adapted crop species. In eastern Kenya, two kinds of seed-provision mechanisms were implemented, Direct Seed Distribution (DSD) and Seed Vouchers and Fairs (SV&F), to tackle emergency situations. Table 3 compares two different approaches used in seed provision during emergency times in eastern Kenya.

**Table 3. Comparison of operational features of direct seed distribution (DSD) and seed vouchers and fairs (SV&F)**

Features	Direct seed distribution	Seed vouchers and fairs
Levels of operation	Provincial or region as a whole	District or division level
Targeted beneficiaries	Based on the implementing agency or imposed by Ministry of Agriculture from the higher level	Community-based selection—seed needs of households assessed
Seed sources	Seed companies, and at times small seed enterprises, such as community seed bulking units	Farmers, local market traders, research institutions, community seed bulking groups, seed firms
Seed procurement process	Tenders or direct agreement with small seed enterprises	No tenders required; vendors can bring grains and certified seeds to the seed fair site.
Seed distribution	Distributed through village chiefs, extension agents, and network of grassroots-level NGOs.	Beneficiaries receive vouchers, exchange them for seed on the day of the fair
Assessment of benefits	Ministry of Agriculture and extension departments make decisions	Seed-needy household decides how to allocate the voucher value

Source: Adapted from Makokha et al. (2005)

Many government and nongovernmental organizations followed the DSD approach until the year 2000. From 2000 to 2001, CRS used the SV&F approach to distribute seeds to needy households. A large number of households (117,369) benefited from the DSD approach during the 2000–2002 period, compared with the SV&F approach (41,583 households) during the same period (See Table 4).

**Table 4. Total value (in millions of Kenya shillings) and quantity (in thousands of kilograms) of seeds distributed through direct seed distribution and seed vouchers and fairs in Eastern Kenya**

Period	Value	Quantity	Districts covered	Number of households
1992–95	156.7	1,741	10	90,907
1996–97	81.3	678	12	80,100
2000–02	63.9	499	9	117,369
<b>Total</b>	<b>301.9</b>	<b>2,918</b>	<b>31</b>	
2000	3.5	64.6		
2001	16.8	870		
2002	2.8	86		
<b>Total</b>	<b>23.1</b>	<b>1,020</b>	<b>8</b>	<b>41,583</b>

Source: Makokha et al. 2004; 2005

The wider coverage of the DSD program was due to its presence in the region for nearly 10 years, compared with the relatively new, alternative approach, SV&F. According to Makokha et al. (2004), since 1992, 32 percent of the total amount spent on seed distribution has been spent in eastern Kenya alone. In addition, farmers also got seeds from local, weekly open-air markets and retail grain shops during or after disasters. The actors involved in seed fairs and open-air markets are more or less identical, except the input/seed fairs are organized by external agencies, and the participation of traders is controlled by certain criteria imposed by the organizers.

### **Direct Seed Distribution (DSD)**

The direct seed distribution method was introduced mainly as an emergency relief tool in the arid and semiarid lands of Kenya during 1992–1993 drought periods. The method is sometimes referred to as *seeds and tools*, because the distribution of seed is often accompanied by the provision of farm equipment (Sperling et al. 2006). The DSD system works on the major assumption that seed is not available in communities during and after emergency situations and that the farmers' seed quality is poor. Therefore, seed is procured from a commercial seed company or companies outside the affected areas and distributed free to the beneficiaries (Remington et al. 2002). DSD is implemented by the government of Kenya in collaboration with local and international NGOs. The government usually contracts to these agencies, and they in turn procure certified seeds from private firms or registered seed companies. This is known as commercial-seed-based DSD. However, there have been instances where noncertified seeds were procured from the community-based seed programs and supplied to the farmers during emergency times



(e.g., Arid Land Resource Management Project) in Mwingi district in 2001. In this case, the DSD could be regarded as a farmer-based seed distribution mechanism.

In Kenya, commercial-seed-based DSD is practiced extensively, since the commercial maize seed sector is well developed, and the government always uses relief opportunities to promote the seed industry (Sperling et al. 2006). The seed firms are selected through a competitive bidding process, which takes into account not only price but also the ability of the firms to supply the types of crop, varieties of seeds, and the quantity of seeds needed. The selected firms are then allowed to distribute seeds in the affected regions either through their networks or through implementing agencies. The beneficiaries at the village level are selected by MoA officials, and the NGOs are mostly involved in both supervision and in the distribution of seeds. The DSD program has a wider geographic coverage and involved a larger number of farming households. In many ways, DSD might pose an opportunity to finance the large-scale dissemination of seeds of new promising research products, by procuring and handling seeds through commercial seed enterprises. Out of the total value and quantity of seeds supplied through DSD in Kenya, more than one-third benefited the eastern districts alone (see Table 5).

**Table 5. Total value (in millions of Kenya shillings) and quantity (in thousands of kilograms) of seeds supplied through direct seed distribution (DSD) in Kenya and eastern Kenya**

Period	Kenya		Eastern Kenya	
	Value	Quantity	Value	Quantity
1992–95	500	7,268.8	156.7	1741
1996–97	300	2,946.0	81.3	678
2000–02	180	1,726.0	63.9	499
<b>Total</b>	<b>980</b>	<b>11,948.0</b>	<b>301.9</b>	<b>2918</b>

Source: Makokha et al. (2004)

Commercially based DSD by its nature often restricted the range of crops and varieties in areas where they had been distributed. For instance, Makokha et al. (2004) noted that DSD had resulted in the distribution of a narrow range of crops and varieties (27) compared with the alternative seed-provision method—SV&F (43). They also found that though DSD benefited more farmers in a wider geographical area, there were more problems with poor targeting and untimely delivery of seeds compared with SV&F. Sometimes the varieties and seeds offered during emergencies through DSD may not be suitable for the marginal farming areas. The free delivery of seed, directly and on a larger scale, not only undermines the nascent local seed enterprises run by local traders and farmers (Tripp 2000), but also affects the functioning of local seed/grain markets.

## **Seed/Input Vouchers and Fairs (SV&F)**

Seed or input fairs have been widely used as an intervention tool, especially after recurrent droughts or conflicts brought significant changes in the provision of seeds in the affected regions or communities. In the seed-distribution method of SV&F, seed-insecure beneficiaries receive vouchers that they can exchange for local seed displayed and sold at the fairs. The sellers or traders, in turn, are reimbursed in cash for the vouchers issued by the implementing agencies such as Catholic Relief Services (CRS). This method was acclaimed as being more cost-effective than DSD, strengthening the local seed markets, and improving the availability of a wider variety of germplasm to the farming community (Omanga and Rossiter 2003; Makokha et al. 2004); it was also acclaimed as strengthening the local agrobiodiversity, which was under the threat of drought, conflict, and floods. The SV&F approach was based on the assumption that the seed needs of the communities during emergencies could be met by the communities themselves. This mechanism encouraged the participation of stakeholders from within and outside the communities. The approach did not prevent farmers from bringing their own seeds for sale or prevent the private firms from participating in the fairs.

During the survey period (October–December 2005), we participated in one of the input fairs conducted at the Ikutha division of Kitui district and organized by CRS through the local Catholic diocese. The fair benefited nearly 450 farmers in and around the Ikutha village division. To facilitate the seed purchases of vulnerable farmers, CRS also issued seed vouchers worth 750 Kenya shillings per seed-needy farm household, along with 200 Kenya shillings worth of fertilizer.<sup>7</sup> Prior to the fair, a seed-needs assessment in the region was conducted by CRS to select the vulnerable farmers. The seed vouchers were exclusively given for purchasing millet, sorghum, and other grain legumes and sweet potato cuttings. Maize was not included in the fair, as it is available extensively in the local markets or through the formal sector. The traders and the organizers (CRS representatives and division crop officers from the MoA) jointly fixed the seed prices at the fair to ensure a fair price and competition for the good quality of seeds. The price of seeds sold in the fair was not as high as open-market prices. In some cases, the traders got a premium price for maintaining seed quality. Three types of traders participated at the fair: farmer-traders, village grain retailers, and full-time traders.

Farmers and traders within a 50–75-kilometer radius participated in the fair. Almost 95 percent of them were women (10 traders and 350 farmers). This is partly because the women in the Kamba region have historically controlled the seed trade. Also, the selected farmers and traders were part of the existing farmers' groups at the village level. The fair organizers further explained that the women in eastern

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<sup>7</sup> The farm households were selected based on a needs assessment; that is, farm households considered seed needy are those who did not have any saved seeds from the previous season, were poor, and had very low purchasing power to invest or buy new seeds for planting.

Kenya actively participate in farmers' groups more than men. Seven crops and 14 different varieties were sold at the fair. Among the crops, beans had the most varietal diversity, followed by pigeon pea, cow pea, and sorghum. The diversity of the materials ranged from traditional, local varieties (admixtures or creolized) to open-pollinated varieties. Almost all the crop seeds that traders brought into the fair were from the grain lots. Neither the farmers nor the traders knew the names of the varieties they handled. Other concerns regarding the conduct of the fair arose from the quality of the seeds brought for sale. It was felt that the organizers of the fair did not pay attention to maintaining even simple purity standards for the materials sold by the traders. Perhaps the recurrence of drought over the last two or three years in the region had led to a scarcity or unavailability of surplus for sale from the farmers, which in turn prompted the traders to engage in desperate buying measures, not paying much attention to quality or varietal details. Also, there was no built-in mechanism in the SV&F approach to verify whether the voucher amount was being used for the intended purposes, namely for household food consumption.

The relief seed approaches used in eastern Kenya have their strengths and weaknesses. Though the DSD approach is more cost-effective than SV&F and covers a larger geographical area, the approach lacks efficiency in targeting seed-needy households, timeliness in supply at times of stress, and participation of local seed markets. On the other hand, the SV&F approach, though efficient in targeting the seed needy and enabling the supply of materials through existing local seed systems, has much higher distribution costs, and often the seeds supplied through SV&Fs are of poor quality. Moreover, SV&F in Kenya is a relatively new concept and less familiar to donors and relief agencies than DSD. Seed fairs could be viewed as one of the key organized farm forums to effectively disseminate new research products (either released or in the pipeline) to benefit local farming communities.

## 6. LOCAL MARKETS

In the arid and semiarid regions of eastern Kenya, less than 5 percent of the seeds sown are certified, improved cultivars, and most of those are maize. However, informal and local market purchases are the major sources of seeds for non-maize cereals and legumes. The local markets referred to here are community- or village-level markets that deal with seeds (especially during planting season) and grains brought by local farmers and traders. Usually the farmers bring grain to these markets, which is subsequently sorted and used by farmers for seed; hence these are also known as local seed/grain markets (Sperling et al. 2006). In the absence of any formalized seed systems for dryland crops, more and more farmers rely on local markets to supply seeds during normal and disaster periods. Traders in local markets play a critical role in rural communities by purchasing grain during harvest and storing and selling it later to the same farmers, either as food or as seed during or just before planting seasons in the case of beans in Rwanda (Sperling 2001). Our interactions with traders in various weekly open-air and retail markets in the eastern districts of Kenya during the short-rains season (October 2005) also confirmed the role of local markets in supplying seeds, especially during emergencies (followed by droughts), for the dryland crops. The short-rains planting season in eastern Kenya usually commences the third week of October. Depending on the onset of rains, traders and farmers participate in the local markets either to purchase or sell seeds (surplus grain). Immediately after the first rains, the farmers start coming to the weekly local open-air markets. The peak market participation occurs only after the second rains in these arid and semiarid regions. It is estimated that more than 90 percent of the seeds are accessed through open-air markets during the short-rains season in eastern Kenya.<sup>8</sup> From our visits to eight major weekly village-level markets during the short-rains season in 2005, we observed that farmers access seeds of cereals and legumes from four types of vendors. They are:

1. Farmer-traders, farmers who turn into traders to dispose of their surplus; they bring their surplus grains to sell as seeds at these weekly open-air markets just before the planting season. They are temporary traders, who sell their surplus grain as seeds (because seeds command higher prices than grain during planting seasons) and use the cash to purchase other consumption and production items from the market. Almost 90 percent of the seed vendors are female, as historically in the Kamba region women control the petty trading activities, especially in weekly village markets. The farmer-traders have a fair amount of varietal knowledge (if not by name), but in many instances, the physical quality is very poor.
2. Full-time resident retailers/traders, or traders who own a retail shop at the market premises and engage in seed and grain sales year-round. These traders either sell grain/seed along with other

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<sup>8</sup> Personal communication with Dr. Paul Omanga, CRS, Nairobi, October–November 2005.

general groceries (these are known as local shopkeepers), or they specialize only in the sale of grains (these are known as grain traders). The regular retailers (resident) do not move across markets. They get seed/grain from other farmers who live in nearby villages (or the farmers approach them) before or after crop harvesting. This way, the resident retailers ensure the source, quality, and certain varietal characteristics of the produce they purchase. Most of these resident retailers deal with food grains year-round and specialize in seed sales just before planting season.

3. Market hoppers or mobile traders, or full-time traders who move from market to market to sell grains and seeds. They are highly mobile, covering at least three to four open-air markets within a 100–120-kilometer radius before the planting season. They purchase seeds from vendors at the open-air weekly markets and also procure grain as seeds from farmers in and around the communities where they live. In the markets we surveyed, nearly 25 percent of the traders traveled to different markets, either to sell seeds or grain. In this way, the market hoppers did bring a certain amount of diversity into the existing seed system. As they traveled across markets, they bought various kinds of seeds or grain from different locations and disseminated them periodically in some other markets. The major drawback of such exchanges is that, in many cases, the seeds they brought in from other markets might not be suitable for the particular agro-ecology of the region. Also, many traders are not aware of the varietal particulars of the sources they deal with. Hence, in most cases farmers were suspicious of the quality of seeds sold by these market hoppers. However, during distress periods, farmers depend on these suppliers, as they are the only primary source that operates efficiently.
4. Private seed companies, which supply small quantities of seeds through their networks (retailers or agro-vet centers). They are not a common source of dryland crop seeds, except for maize. But private firms remain the major source for supplying certified seeds to government programs, such as DSD, during normal and distress times.

The weekly open-air village markets we visited were mostly dominated by farmer-traders (50–60 percent) during the planting season, and the rest (40–50 percent) were regular traders or market hoppers. Inside the market premises, one could also find three to four agro-vet centers and food retailers with permanent shopping structures, who operated all through the year. In general the agro-vet centers sold mostly maize and vegetable seeds and did not sell other cereals and legumes. The food retailers in the market premises stocked seeds procured from local farmers and/or from their own farms. They sold part of their grain as seed after cleaning and packing it, to meet the immediate seed needs just before the planting season. The open-air markets were usually organized and managed by local administrative authorities. The authorities collected market fees (20–30 Ksh/day) from the vendors to operate from these

markets. Table 6 provides a brief description of the major open-air weekly local markets in the eastern Kenya region, the participants, and the markets' characteristics.

**Table 6. Characteristics of the open-air weekly markets surveyed in eastern Kenya (2005)**

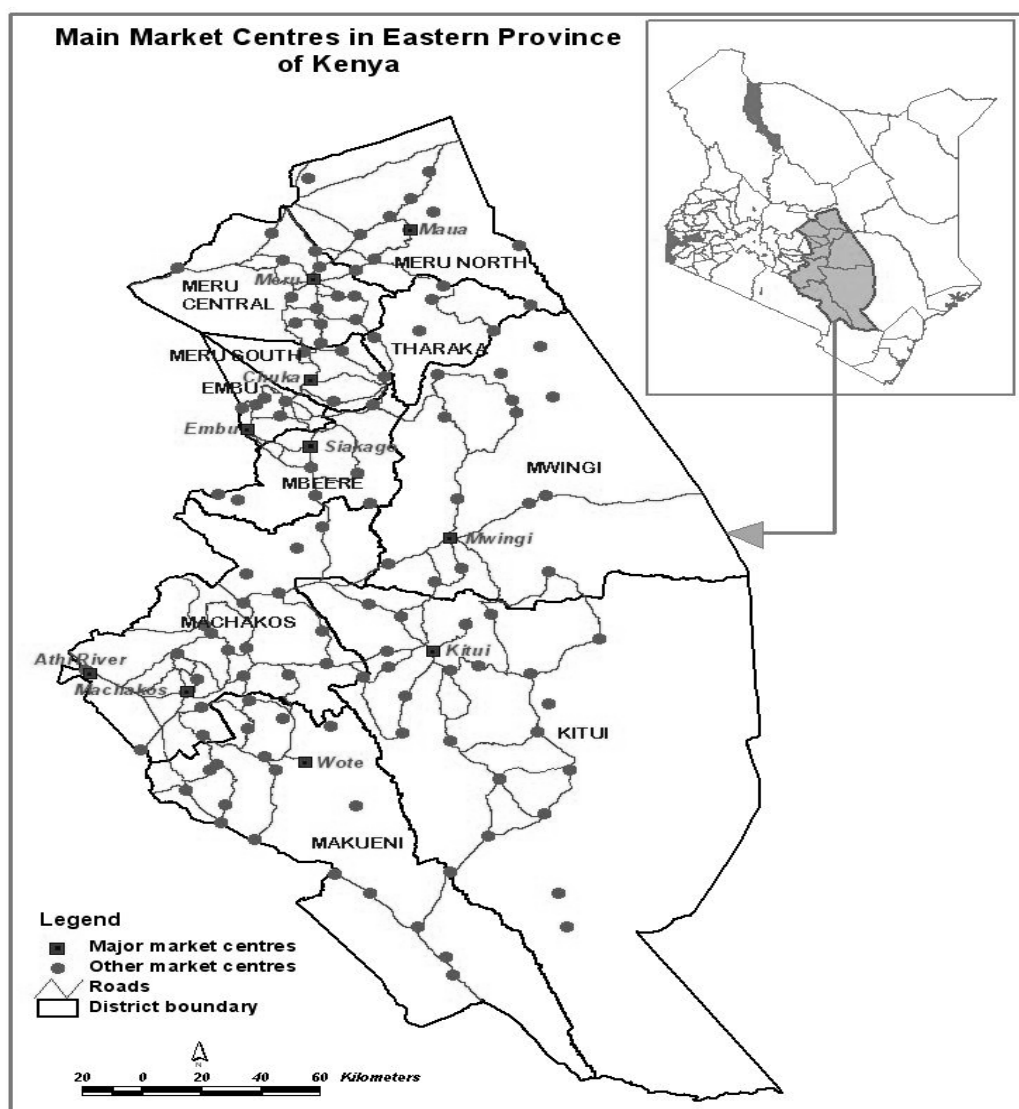
Market	Total daytime traders/ market	Market hoppers	Crops handled by vendors	Agro-vet shops	Grain & local shops
1. Kitui (Kitui district)	5	0	pigeon pea (2), maize (4), cowpea (2), beans (3)	10	4
2. Kabati (Kitui district)	15	4	pigeon pea (2), maize (4), beans (5), green gram (1), cowpea (1), sorghum (2)	2	1
3. Migueni (Mwingi district)	30	7	maize (4), sorghum (2), millet (1), beans (4), pigeon pea (2)	4	6
4. Kathonzweni (Makueni district)	50	12	sorghum (2), pigeon pea (4), beans (4), maize (4), cowpea (2)	4	4
5. Matilico (Makueni district)	65	9	pigeon pea (4), maize (2), beans (3), cowpea (1)	4	3
6. Karamba (Mberre district)	10	2	green gram (1), pigeon pea (1), maize (2), beans (2)	2	1
7. Makutani (Mberre district)	40	8	finger millet (2), sorghum (2), pigeon pea (4), maize (2), beans (4), green gram (1)	4	3

Source: Authors' observations on the market days during October–December 2005, during and before short rains. Figures in parentheses indicate the number of distinct varieties handled by vendors per crop.

From these markets it is evident that among the vendor types, daytime traders who were also part-time farmers engaged mostly in seed sales, followed by market hoppers (or mobile traders). Though agro-vets and other local shops contributed to seed sales before planting season, the amount of seeds sold was negligible, especially for dryland cereals and legumes. Most of the agro-vets sold hybrid and improved varieties of maize and vegetable seeds. The weekly open-air markets served farmers living within a radius of 50–75 kilometers and were mostly dominated by farmer-traders. Farmers brought their own farm produce for sale, or they purchased grains from their neighboring farmers or villages. Though most of the farmer-traders in this market identified the varieties either by duration or culinary characteristics, one could find admixtures of improved and local types among the seed lots sold in the case of grain legumes. Among the local village markets surveyed, Kathonzweni is one of the leading markets in eastern Kenya, with higher seed prices and varietal diversity for grain legumes such as pigeon pea. This market is located very close to the Campe-de-mauve, ICRISAT's dryland crops research station specializing in sorghum,

millet, and pigeon pea. The proximity to ICRISAT and its field demonstration activities has played a key role in the widespread adoption and availability of improved varieties of dryland crops, especially pigeon pea, in the region. The location of major market centers along with road networks in eastern Kenya is summarized in figure 2.

**Figure 2. Major market centers in eastern province of Kenya**



Source: ILRI-GIS lab, Nairobi, Kenya

The other major markets located in the region include the Kitui open-air weekly market, located in the divisional headquarters of Kitui. It is dominated mostly by seed retailers or vendors with permanent grain/seed shops at the market premises. Because the Kitui market is the major market for the central region, which is slightly wetter than other divisions, the demand for maize, beans, and vegetable seeds is

very high compared with that for other dryland crops. The Matilico village market located in the Makueni district is well known for the availability of improved sorghum varieties in the region. The traders sold *Serena*, *Seredo*, *Gadam*, and *KM-1*. The Makutani open-air weekly market, located on the main road junction of Embu and Nyeri, is one of the major market centers serving both Embu and Mberre districts. This is one of the major assembling markets for grain and seeds of pigeon pea, beans, finger millet, sorghum, and maize in eastern Kenya. The seeds come from as far away as the foothills of Mt. Kenya, especially seeds for small grain crops. The Makutani market area is also known for three of the major land races of pigeon pea (long-duration cultivars), namely Kimeru, Kionza, and Githwariga. Another important feature of the Makutani location is the highest adoption rate of the improved cultivar pigeon pea, *NPP 670* (Jones et al. 2001). This variety, along with its variants, still dominates the pigeon pea cultivation in this region. The *NPP 670* pigeon pea variety, which was introduced in early 1990s as a part of the participatory research assessment by the University of Nairobi, later became very popular among the farmers.

From our visits to major local markets in eastern Kenya, we could infer that farmers depend on local markets for their seed needs, especially for crops like pigeon pea and sorghum. On average every year the farmers in eastern Kenya require at least 1,300 tons of good quality pigeon pea seeds during the short-rains season (Personal communication with Dr. Paul Omanga, 2005). Virtually all this seed is grain produced by farmers or saved from the previous harvests and accessed as seed mainly through local markets. The local markets can play a significant role in serving a larger population in both normal and emergency times, as the existing seed supply mechanisms serve only targeted populations in specific areas. Some of the major concerns regarding the seeds from local markets are the lack of varietal identity and quality. It was evident that the traders were not aware of improved varieties and crop management practices in most of the markets we visited. However, the farmer-traders in Kathonziweni and Matilico, who were also farmer-demonstrators for ICRISAT and KARI, knew varietal details of the crops they sold. This provides an opportunity to link the existing formal seed sector initiatives with vendors in local markets, especially in areas where the farmers specialize in high-value, marketable crops like pigeon pea. This would enable the farmers in turn to meet the stringent quality standards demanded by end users (Jones et al. 2001).

Furthermore, the role played by local markets in any seed-intervention mechanism is inevitable. Mechanisms such as DSD usually operate on an assumption that drought or floods cause scarcity of seeds, whereas the seed fairs approach is built on the fact that farmers face seed-accessibility issues. The relief seed mechanisms are directly or indirectly built around the existing local markets and seed supplies in the communities. For example, the seed fairs conducted in eastern Kenya and elsewhere show that more than 70 percent of the seeds provided in these fairs were from local vendors and/or farmers. These



vendors usually double up their seed supplies during stress periods or during their participation in fairs. This implies that the local seed system is capable of providing the required amounts of seeds to the affected communities even during acute stress periods (Makokha et al. 2005). A built-in mechanism exists among the farming communities in arid and semiarid regions to retain a part of their own seed for planting as well for sale to others in local markets. Further, our detailed discussions with seed users, that is, farmers, in eastern Kenya also have confirmed the importance of local markets in semiarid environments during regular and disaster periods. In the current system, farmers have very limited access to improved seed materials for dryland crops through certain interventions. Even if farmers would like to procure improved planting materials in the local markets, there are no outlets to sell improved varieties of dryland crops except maize and beans. The inconsistent and discontinuous nature of these programs has had an impact on farmers' seed systems in eastern Kenya. For instance, the varieties and seeds supplied through certain government-assisted programs were not timely and appropriate. Thus, most often farmers in semiarid regions rely on local markets to meet their immediate seed needs during normal periods as well as during emergencies.

## 7. CONCLUSIONS

Typically one could find the involvement of formal institutions in seed provision for dryland crops during two occasions in eastern Kenya, regular and emergency times. But very often the formal supply mechanisms either sideline or limit their role in providing dryland crops seed, except for maize. In the absence of any well-defined formal seed-supply systems for non-maize crops, farmers' immediate seed needs are met mostly by the local markets. In our surveys, farmers expressed keen interest in using improved cultivars of dryland crops but were constrained by their availability through the existing seed systems. The private firms do not have sufficient economic incentives to reproduce and supply seeds of dryland crops. The reason is twofold: First, the profit margins are very low, with poor seed-replacement rates among the semiarid farming communities of eastern Kenya. Second, the Kenyan seed laws and certification procedures for major dryland cereals and legumes limit the participation of private firms in seed-related activities.

Over years, several seed-based development interventions were initiated by the government of Kenya, along with NGOs and research organizations, to improve the access and availability of seeds of dryland crops in eastern Kenya. Some of the programs included community-based seed production programs, producer marketing groups, and small seed packs distribution. These initiatives were not designed as seed-emergency tools, but as mechanisms to provide long-term, sustainable solutions to local seed market failures by improving access to improved varieties that are locally adaptable. However, they could not be sustained in the long run due to poor marketing linkages and quality standards adopted by the farmers' groups. In addition, free delivery of seeds through emergency/relief seed mechanisms on a larger scale also affected the nascent local seed enterprises and the functioning of local seed/grain markets. In the absence of any formalized seed systems that could provide improved access to dryland crop seeds, more and more farmers in eastern Kenya rely on local markets to meet their immediate seed needs during normal and disaster periods. It is estimated that more than 90 percent of the seeds are accessed through open-air markets during the short-rains season in eastern Kenya. The seeds in open-air local markets were sold by four types of vendors: farmer-traders, resident traders, mobile traders, and agro-vets. It was also found that the role played by local markets and their vendors in any seed-relief mechanism was inevitable. More than 70 percent of the seeds provided in the seed fairs were supplied by local vendors and/or farmers. Despite local markets being able to meet the existing demand, the quality of the materials supplied is often questionable and compromised, as the distinction between grain and seeds is very thin.

What is lacking in the existing seed-supply mechanism for dryland crops in eastern Kenya is the availability of quality improved planting materials at the right time. Since long rains are not reliable for

raising crops in the arid and semiarid regions of eastern Kenya, most of the seed-provision mechanisms are targeted for the primary, short-rains season. However, the existing seed-supply mechanism is not only constrained by a need to find quality seeds but also by the limited availability of a portfolio of varieties to suit the agro-ecology. Efforts could be made to produce the improved varieties of dryland crops during the off-season in the eastern Kenya region itself (wherever moderate irrigation facilities are available) for their supply during the short-rains season.<sup>9</sup> This would ease the distribution time as well as improve the supply of seeds adapted to the marginal environments of eastern Kenya. Small- and medium-sized private seed companies and village-level entrepreneurs who are interested could be organized to do the seed propagation of popular varieties at the local communities. They can be effectively linked to the existing outlets (traders in weekly markets) for further distribution. Do seed-relief mechanisms undermine existing local markets or market development? The seed fairs as they are practiced promote the use of local materials adapted to the local environment. But the same fairs could be effectively used as one of the key farm forums to disseminate new research products (either released or in the pipeline) that would benefit the local farming community. Also, if the agencies responsible for relief-seed contracts can hold periodic consultations with the Seed Traders Association of Kenya to negotiate seed-supply contracts with the private firms and also to impose seed-quality control measures that would be useful in planning such seed interventions.

The seed-intervention mechanisms implemented so far have played a fair role in providing good quality planting materials. At the same time, the role of local markets in the provision of seeds of dryland cereals and legumes is indispensable. Through proper synergies between formal seed-intervention programs and existing informal, but monetized (local-market-based), sources, one could expect enhanced local crop diversity as well as improved seed access for farming communities in these arid and semiarid regions of eastern Kenya.

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<sup>9</sup> The seed reproduction activities are small-scale, specialized, and require few skilled farmers; on the other hand, seed distribution or supply is a large-scale operation that requires a huge network of traders or retailers to cover all of eastern Kenya, before or during the planting season.

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